Chapter 3

True-False — Preferences

Topic: Preferences
Difficulty: 1
% Correct Responses: 70
Discrimination Index: 31
Correct Answer: False

3.1 If preferences are transitive, more is always preferred to less.

Topic: Preferences
Difficulty: 1
% Correct Responses: 89
Discrimination Index: 21
Correct Answer: False

3.2 A person with reflexive preferences is someone who does not shop carefully.

Topic: Preferences
Difficulty: 2
% Correct Responses: 94
Discrimination Index: 6
Correct Answer: True

3.3 If someone has the utility function $U = 1000+2min\{x, y\}$ then x and y are perfect complements for that person.

Topic: Preferences
Difficulty: 1
% Correct Responses: 68
Discrimination Index: 40
Correct Answer: True

3.4 A consumer with convex preferences who is indifferent between the bundles $(1, 2)$ and $(9, 6)$ will like the bundle $(5, 4)$ at least as well as either of the first two bundles.

Topic: Preferences
Difficulty: 1
% Correct Responses: 68
Discrimination Index: 40
Correct Answer: True

3.5 A consumer with convex preferences who is indifferent between the bundles $(2, 3)$ and $(10, 9)$ will like the bundle $(6, 6)$ at least as well as either of the first two bundles.

Topic: Preferences
Difficulty: 2
% Correct Responses: 81
Discrimination Index: 0
Correct Answer: True

3.6 If there are two goods, if a consumer prefers more of each good to less, and if she has diminishing marginal rate of substitution, then her preferences are convex.

Topic: Preferences
% Correct Responses: 75
Correct Answer: False
Difficulty: 2
Discrimination Index: 11

3.7 If preferences are convex, then for any commodity bundle x, the set of commodity bundles that are worse than x is a convex set.

Topic: Preferences
% Correct Responses: 58
Correct Answer: False
Difficulty: 2
Discrimination Index: 0

3.8 Bill Katz prefers more of good 1 to less and he prefers less of good 2 to more. Bill has convex preferences. If we draw his indifference curves with good 1 on the horizontal axis and good 2 on the vertical axis, then his indifference curves have positive slope but get steeper as they rise.

Topic: Preferences
% Correct Responses: 99
Correct Answer: False
Difficulty: 1
Discrimination Index: 0

3.9 The marginal rate of substitution measures the distance between one indifference curve and the next one.

Topic: Preferences
% Correct Responses: 79
Correct Answer: False
Difficulty: 1
Discrimination Index: 11

3.10 Ambrose has an indifference curve with equation $x_2 = 20 - 4x_1^{1/2}$. When Ambrose is consuming the bundle $(4, 16)$, his marginal rate of substitution is $-5/4$.

Topic: Preferences
% Correct Responses: 77
Correct Answer: False
Difficulty: 1
Discrimination Index: 34

3.11 Nancy's psychology teacher will give her a course grade that is the maximum of her scores on three midterm examinations. Nancy has convex preferences over the possible combinations of midterm scores.

Topic: Preferences
% Correct Responses: 39
Correct Answer: False

Difficulty: 3
Discrimination Index: 26

3.12 If Melody has more classical records than rock and roll records, she is willing to exchange exactly 1 classical record for 2 rock and roll records, but if she has more rock and roll records than classical records, then she is willing to exchange exactly 1 rock and roll record for 2 classical records. Melody has convex preferences.

Topic: Preferences
% Correct Responses: 71
Correct Answer: False

Difficulty: 1
Discrimination Index: 17

3.13 Josephine buys 3 quarts of milk and 2 pounds of butter when milk sells for $2 a quart and butter sells for $1 a pound. Wilma buys 2 quarts of milk and 3 pounds of butter at the same prices. Josephine's marginal rate of substitution between milk and butter is greater than Wilma's.

Topic: Preferences
% Correct Responses: 29
Correct Answer: True

Difficulty: 2
Discrimination Index: 29

3.14 A consumer who is unable to detect small differences in the amount of water in her beer could have a transitive strict preference relation but is unlikely to have a transitive indifference relation.

Topic: Preferences
% Correct Responses: 85
Correct Answer: B

Difficulty: 1
Discrimination Index: 23

3.1 Fanny consumes goods x and y. Her indifference curves are described by the formula $y = k/(x+7)$. Higher values of k correspond to better indifference curves. Which of the following is true?

(a) Fanny likes good y and hates good x.

(b) Fanny prefers bundle $(8, 9)$ to bundle $(9, 8)$.

(c) Fanny prefers bundle $(9, 5)$ to bundle $(5, 9)$.

(d) Fanny likes good x and hates good y.

(e) More than one of the above statements are true.

Topic: Preferences
% Correct Responses: 85
Correct Answer: B

Difficulty: 1
Discrimination Index: 23

3.2 Heidi consumes goods x and y. Her indifference curves are described by the formula $y = k/(x+6)$. Higher values of k correspond to better indifference curves. Which of the following is true?

(a) Heidi likes good y and hates good x.

(b) Heidi prefers bundle $(10, 15)$ to bundle $(15, 10)$.

(c) Heidi prefers bundle $(9, 8)$ to bundle $(8, 9)$.

(d) Heidi likes good x and hates good y.

(e) More than one of the above statements are true.

Topic: Preferences
% Correct Responses: 67
Correct Answer: D

Difficulty: 1
Discrimination Index: 14

3.3 George's indifference curves are circles, all of which are centered at $(18, 20)$. Of any two indifference circles, he would rather be on the inner one than the outer one. Which of the following is true?

(a) George's preferences are not complete.

(b) George prefers $(24, 26)$ to $(14, 17)$.

(c) George $prefers(14, 26)$ to $(14, 17)$.

(d) George prefers $(16, 19)$ to $(23, 26)$.

(e) More than one of the above statements are true.

Topic: Preferences
% Correct Responses: 67
Correct Answer: D
Difficulty: 1
Discrimination Index: 14

3.4 Yoram's indifference curves are circles, all of which are centered at $(12, 19)$. Of any two indifference circles, he would rather be on the inner one than the outer one. Which of the following is true?

(a) Yoram's preferences are not complete.

(b) Yoram prefers $(18, 25)$ to $(8, 16)$.

(c) Yoram $prefers(8, 25)$ to $(8, 16)$.

(d) Yoram prefers $(8, 17)$ to $(18, 28)$.

(e) More than one of the above statements are true.

Topic: Preferences
% Correct Responses: 0
Correct Answer: B
Difficulty: 1
Discrimination Index: 0

3.5 Manuel consumes only apples and bananas. He prefers more apples to less, but he gets tired of bananas. If he consumes fewer than 17 bananas per week, he thinks that one banana is a perfect substitute for one apple. But you would have to pay him one apple for each banana beyond 17 that he consumes. The indifference curve that passes through the consumption bundle with 25 apples and 26 bananas also passes through the bundle with A apples and 11 bananas, where A equals:

(a) 21

(b) 22

(c) 24

(d) 26

(e) None of the above.

Topic: Preferences
Difficulty: 1
% Correct Responses: 0
Discrimination Index: 0
Correct Answer: B

3.6 Wilbur consumes only apples and bananas. He prefers more apples to less, but he gets tired of bananas. If he consumes fewer than 18 bananas per week, he thinks that one banana is a perfect substitute for one apple. But you would have to pay him one apple for each banana beyond 18 that he consumes. The indifference curve that passes through the consumption bundle with 27 apples and 30 bananas also passes through the bundle with A apples and 13 bananas, where A equals:

(a) 17

(b) 20

(c) 26

(d) 28

(e) None of the above.

Topic: Preferences
Difficulty: 1
% Correct Responses: 75
Discrimination Index: 50
Correct Answer: E

3.7 If two goods are both desirable and preferences are convex, then:

(a) there must be a kink in the indifference curves.

(b) indifference "curves" must be straight lines.

(c) if two bundles are indifferent, then an average of the two bundles is worse than either one.

(d) the marginal rate of substitution is constant along indifference curves

(e) None of the above.

Topic: Preferences
Difficulty: 2
% Correct Responses: 53
Discrimination Index: 34
Correct Answer: B

3.8 If there are only two goods, if more of good 1 is always preferred to less, and if less of good 2 is always preferred to more, then:

(a) indifference curves slope downwards.

(b) indifference curves slope upwards.

(c) indifference curves may cross.

(d) indifference curves could take the form of ellipses.

(e) None of the above.

Topic: Preferences
% Correct Responses: 75
Correct Answer: D

Difficulty: 2
Discrimination Index: 29

3.9 If two goods are perfect complements:

(a) there is a bliss point and the indifference curves surround this point.

(b) consumers will only buy the cheaper of the two goods.

(c) indifference curves have a positive slope.

(d) None of the above.

Topic: Preferences
% Correct Responses: 0
Correct Answer: C

Difficulty: 2
Discrimination Index: 0

3.10 The relation "is preferred to" between commodity bundles is just one example of a binary relation. Another example is the relation "is a full brother of" defined over the set of all human beings. Let xRy mean person x is a full brother of person y.

(a) The relation R is reflexive, transitive, and complete.

(b) The relation R is transitive and complete but not reflexive.

(c) The relation R is transitive but not complete or reflexive.

(d) The relation R is complete but not transitive or reflexive.

(e) The relation R is neither reflexive, transitive, nor complete.

Topic: Preferences
% Correct Responses: 61
Correct Answer: C

Difficulty: 1
Discrimination Index: 20

3.11 Preferences are said to be monotonic if:

(a) all goods must be consumed in fixed proportions.

(b) all goods are perfect substitutes.

(c) more is always preferred to less.

(d) there is diminishing marginal rate of substitution.

(e) None of the above.

Topic: Preferences
% Correct Responses: 8
Correct Answer: C
Difficulty: 3
Discrimination Index: 0

3.12 Toby Talkalot subscribes to a local phone service that charges a fixed fee of $10 per month and allows him to place as many local phone calls as he likes without further charge. Let Good 1 be an aggregate of commodities other than local phone use and let Good 2 be local phone use. (Measure Good 1 on the horizontal axis and Good 2 on the vertical axis.) On Monday, Toby didn't use the telephone at all. From this we can conclude that the slope m of his indifference curve at the consumption bundle he chose on Monday was:

(a) positive.

(b) less than or equal to 0.

(c) 0.

(d) greater than or equal to 0.

(e) negative.

Topic: Preferences
% Correct Responses: 22
Correct Answer: B
Difficulty: 3
Discrimination Index: 26

3.13 Professor Goodheart's colleague Dr. Kremepuff gives 3 midterm exams. He drops the lowest and gives each student her average score on the other two exams. Polly Sigh is taking his course and has a 60 on her first exam. Let x_2 be her score on the second exam and x_3 be her score on the third exam. If we draw her indifference curves for scores on the second and third exams with x_2 represented by the horizontal axis and x_3 represented by the vertical axis, then her indifference curve through the point $(x_2, x_3) = (50, 70)$ is:

(a) L-shaped with a kink where $x_2 = x_3$.

(b) three line segments, one vertical, one horizontal, and one running from $(70, 60)$ to $(60, 70)$.

(c) a straight line, running from $(0, 120)$ to $(120, 0)$.

(d) three line segments, one vertical, one horizontal, and one running from $(70, 50)$ to $(50, 70)$.

(e) a V-shaped curve with its point at $(50, 70)$.

Topic: Preferences
% Correct Responses: 92
Correct Answer: E
Difficulty: 0
Discrimination Index: 19

3.14 Charlie's indifference curves have the equation $x_B = constant/x_A$, where larger constants denote better indifference curves. Charlie strictly prefers the bundle (10, 19) to the bundle:

(a) (19, 10).

(b) (11, 18).

(c) (15, 15).

(d) more than one of these bundles.

(e) none of these bundles.

Topic: Preferences
% Correct Responses: 92
Correct Answer: E
Difficulty: 0
Discrimination Index: 19

3.15 Charlie's indifference curves have the equation $x_B = constant/x_A$, where larger constants denote better indifference curves. Charlie strictly prefers the bundle (9, 19) to the bundle:

(a) (19, 9).

(b) (10, 18).

(c) (12, 15).

(d) more than one of these bundles.

(e) none of these bundles.

Topic: Preferences
% Correct Responses: 77
Correct Answer: C
Difficulty: 2
Discrimination Index: 17

3.16 Ambrose has indifference curves with the equation $x_2 = constant - 4x_1^{1/2}$ where larger constants correspond to higher indifference curves. If good 1 is drawn on the horizontal axis and good 2 on the vertical axis, what is the slope of Ambrose's indifference curve when his consumption bundle is (16, 9)?

(a) $-16/9$

(b) $-9/16$

(c) -0.50

(d) -13

(e) -4

Topic: Preferences
% Correct Responses: 77
Correct Answer: C
Difficulty: 2
Discrimination Index: 17

3.17 Ambrose has indifference curves with the equation $x_2 = constant - 4x_1^{1/2}$ where larger constants correspond to higher indifference curves. If good 1 is drawn on the horizontal axis and good 2 on the vertical axis, what is the slope of Ambrose's indifference curve when his consumption bundle is $(9, 14)$?

(a) $-9/14$

(b) $-14/9$

(c) -0.67

(d) -17

(e) -3

Topic: Preferences
% Correct Responses: 93
Correct Answer: A
Difficulty: 2
Discrimination Index: 4

3.18 Nancy Lerner is taking a course from Professor Goodheart who will count only her best midterm grade and from Professor Stern who will count only her worst midterm grade. In one of her classes, Nancy has scores of 40 on her first midterm and 50 on her second midterm. When the first midterm score is measured on the horizontal axis and her second midterm score on the vertical, her indifference curve has a slope of zero at the point $(40, 50)$. Therefore it must be that:

(a) this class could be Professor Goodheart's, but couldn't be Professor Stern's.

(b) this class could be Professor Stern's, but couldn't be Professor Goodheart's.

(c) this class couldn't be either Goodheart's or Stern's.

(d) this class could be either Goodheart's or Stern's.

(e) None of the other options are correct.

Topic: Preferences
% Correct Responses: 93
Correct Answer: A
Difficulty: 2
Discrimination Index: 4

3.19 Nancy Lerner is taking a course from Professor Goodheart who will count only her best midterm grade and from Professor Stern who will count only her worst midterm grade. In one of her classes, Nancy has scores of 70 on her first midterm and 60 on her second midterm. When the first midterm score is measured on the horizontal axis and her second midterm score on the vertical, her indifference curve has a slope of zero at the point $(70, 60)$. Therefore it must be that:

(a) this class could be Professor Goodheart's, but couldn't be Professor Stern's.

(b) this class could be Professor Stern's, but couldn't be Professor Goodheart's.

(c) this class couldn't be either Goodheart's or Stern's.

(d) this class could be either Goodheart's or Stern's.

(e) None of the other options are correct.

Topic: Preferences
% Correct Responses: 56
Correct Answer: D
Difficulty: 2
Discrimination Index: 65

3.20 If we graph Mary Granola's indifference curves with avocados on the horizontal axis and grapefruits on the vertical axis, then whenever she has more grapefruits than avocados, the slope of her indifference curve is -2. Whenever she has more avocados than grapefruits, the slope is $-1/2$. Mary would be indifferent between a bundle with 11 avocados and 23 grapefruits and another bundle that has 19 avocados and:

(a) 15 grapefruits.

(b) 19 grapefruits.

(c) 11 grapefruits.

(d) 13 grapefruits.

(e) 14 grapefruits.

Topic: Preferences
Difficulty: 2
% Correct Responses: 56
Discrimination Index: 65
Correct Answer: D

3.21 If we graph Mary Granola's indifference curves with avocados on the horizontal axis and grapefruits on the vertical axis, then whenever she has more grapefruits than avocados, the slope of her indifference curve is -2. Whenever she has more avocados than grapefruits, the slope is $-1/2$. Mary would be indifferent between a bundle with 24 avocados and 36 grapefruits and another bundle that has 32 avocados and:

(a) 28 grapefruits.

(b) 32 grapefruits.

(c) 24 grapefruits.

(d) 26 grapefruits.

(e) 27 grapefruits.

Topic: Preferences
Difficulty: 2
% Correct Responses: 75
Discrimination Index: 29
Correct Answer: B

3.22 Recall that Tommy Twit's mother measures the departure of any bundle from her favorite bundle for Tommy by the sum of the absolute values of the differences. Her favorite bundle for Tommy is $(2, 7) - -that$ is, 2 cookies and 7 glasses of milk. Tommy's mother's indifference curve that passes through the point $(c, m) = (5, 4)$ also passes through:

(a) the point $(8, 1)$.

(b) the points $(2, 1)$, $(8, 7)$, and $(5, 10)$.

(c) the point $(2, 7)$.

(d) the points $(5, 7)$, $(2, 4)$, and $(2, 10)$.

(e) None of the above.

Topic: Preferences
Difficulty: 2
% Correct Responses: 75
Discrimination Index: 29
Correct Answer: B

3.23 Recall that Tommy Twit's mother measures the departure of any bundle from her favorite bundle for Tommy by the sum of the absolute values of the differences. Her favorite bundle for Tommy is $(2, 7) - -that$ is, 2 cookies and 7 glasses of milk. Tommy's mother's indifference curve that passes through the point $(c, m) = (3, 6)$ also passes through:

(a) the point $(4, 5)$.

(b) the points $(2, 5)$, $(4, 7)$, and $(3, 8)$.

(c) the point $(2, 7)$.

(d) the points $(3, 7)$, $(2, 6)$, and $(2, 8)$.

(e) None of the above.

Topic: Preferences
Difficulty: 0
% Correct Responses: 0
Discrimination Index: 0
Correct Answer: D

3.24 Scholastica is taking a class from Professor Chaos. Professor Chaos gives two tests in this course and determines a student's grade as follows. He calculates the smaller of the following two numbers: half of the score on the first test (which is a relatively easy test) and the actual score on the second test. He gives each student a numerical score equal to the result of this calculation and then ranks the students. Scholastica would like to be ranked as high as possible in Professor Chaos' rankings. If we represent her score on the first exam on the horizontal axis and her score on the second exam on the vertical axis, then her indifference curves:

(a) are L-shaped with kinks where the two exam scores are equal.

(b) have sections with a slope -2 and sections with a slope $1/2$.

(c) are positively sloped.

(d) are L-shaped with kinks where the exam 1 score is twice the exam 2 score.

(e) are straight lines with a slope of $-1/2$.

Topic: Preferences
Difficulty: 0
% Correct Responses: 0
Discrimination Index: 0
Correct Answer: D

3.25 In Professor Meanscore's class, the first midterm exam and the second midterm exam are weighted equally toward the final grade. With the first midterm's score on the horizontal axis, and the second midterm's score on the vertical axis, indifference curves between the two exam scores are

(a) L-shaped with lines extending upward and to the right.

(b) L-shaped with lines extending downward and to the left.

(c) parabola shaped.

(d) straight lines with slope -1.

(e) straight lines with slope 2.

Topic: Preferences
Difficulty: 0
% Correct Responses: 0
Discrimination Index: 0
Correct Answer: C

3.26 Professor Stern's colleague, Dr. Schmertz, gives one midterm exam and a final exam. He weights the final twice as heavily as the midterm to determine the course grade. No grades can be dropped. If the midterm score is represented on the horizontal axis and the final score on the vertical axis, and if a student in Dr. Schmertz's class cares only about her course grade, her indifference curve is

(a) a line with slope -2.

(b) a line with slope -1.

(c) a line with slope -0.5.

(d) L-shaped with the kink at $(x, 2x)$.

(e) L-shaped with the kink at $(2x, x)$.

Topic: Preferences
Difficulty: 0
% Correct Responses: 0
Discrimination Index: 0
Correct Answer: E

3.27 I prefer 6 apples and 1 orange to 5 apples and 2 oranges. From this we can conclude that

(a) my preferences are transitive.

(b) my preferences are complete.

(c) my preferences are convex.

(d) my preferences obey the Law of Demand.

(e) none of the above.

Topic: Preferences
% Correct Responses: 0

Difficulty: 3
Discrimination Index: 0

3.1 Draw graphs with quantities of pepperoni pizza on the horizontal axis and anchovy pizza on the vertical axis to illustrate the following situations. In each case draw two different indifference curves and make a little arrow pointing in the direction of greater preference.

a) Marvin loves pepperoni pizza and hates anchovy pizza.

b) Mavis hates anchovy pizza and is completely indifferent about pepperoni pizza.

Answer: a) Indifference curves slopes up and to the right. Arrow points down and to the left. *b*) Indifference curves are horizontal lines. Arrow points down.

Topic: Preferences
Difficulty: 3
% Correct Responses: 0
Discrimination Index: 0

3.2 Coach Steroid likes his players to be big, fast, and obedient. If player A is better than player B in two of these three characteristics, Steroid will prefer A to B. Three players try out for quarterback. Wilbur Westinghouse weighs 320 pounds, runs very slowly, and is quite obedient. Harold Hotpoint weighs 240 pounds, runs extremely fast, and is extremely disobedient. Jerry Jacuzzi weighs 150 pounds, runs at average speed, and is extremely obedient. Does Coach Steroid have transitive preferences? Explain your answer.

Answer: No. Steroid prefers W to H because W is heavier and more obedient. He preferes H to J because H is heavier and faster. But he prefers J to W because J is more obedient and faster than W. Since his preferences have a cycle, they cannot be transitive.

Topic: Preferences
Difficulty: 3
% Correct Responses: 0
Discrimination Index: 0

3.3 Belinda loves chocolate and always thinks that more is better than less. Belinda thinks that a few piano lessons would be worse than none at all but if she had enough piano lessons to get good at playing the piano, she would prefer more lessons to less. Draw a graph with piano lessons on the horizontal axis and chocolate on the vertical axis. On your graph sketch two indifference curves for Belinda that would be consistent with this story. Label the better of the two indifference curves AA and the worse one BB.

Answer: The indifference curves would look something like inverted $U's$. (The area under these curves needn't be necessarily convex.) The better of the two curves drawn is the higher one.

Topic: Preferences
% Correct Responses: 0
Difficulty: 3
Discrimination Index: 0

3.4 Mac Rowe doesn't sweat the petty stuff. In fact, he just cannot detect small differences. He consumes two goods, x and y. He prefers the bundle (x, y) to the bundle (x', y') if and only if $xy - x'y' > 1$. Otherwise he is indifferent between the two bundles. Show:

(a) that the relation of indifference is not transitive for Mac (Hint: Give an example.)

(b) that the preferred relation is transitive for Mac.

Answer: Consider the bundles $A = (1, 1)$, $B = (1, 1.75)$, $C = (1, 2.5)$. Then A is indifferent to B and B to C but C is preferred to A. To see that strict preference is transitive, suppose we have any three bundles, (x, y), (x', y') and (x'', y''). If the first is preferred to the second and the second to the third, then $xy - x'y' > 1$ and $x'y' - x''y'' > 1$. Simple algebra shows that $xy - x''y'' > 1$. Therefore the first must be preferred to the third.

Topic: Preferences
% Correct Responses: 0
Difficulty: 3
Discrimination Index: 0

3.5 Blanche Carter has devised a system for rating the males in her economics class. She cares about their intelligence and their looks. She has ranked each male on a scale of 1 to 5 for intelligence and 1 to 3 for looks. She defines a preference re lation, R, as follows: xRy if boy x scores at least as high as boy y in either looks or in intelligence. Give an example to show that Blanche's method of determining preferences might not lead to transitive preferences.

Answer: Suppose boy x has rankings 1 and 2, boy y has rankings 3 and 1 and boy z has rankings 2 and 3. Then xRy because x is better looking than y and yRz because y is smarter than z. But it is not true that xRz. In fact z is both smarter and better looking than x.

Topic: Preferences
% Correct Responses: 0
Difficulty: 2
Discrimination Index: 0

3.6 Explain how it would be possible to cheat someone who had intransitive preferences. Be explicit about what you would offer him if you were trying to exploit his intransitivity and what he would do in response.

Answer: Suppose that he has bundle C right now and prefers A to B, B to C, and C to A. If you offer him a trade that leaves him at B instead of C, he will accept the deal. If you now offer him a trade that leaves him at A instead of B, he will accept that. But he will prefer to be back where he originally was to where he is. So you could offer to give him back his original bundle, minus a reward to you for your efforts and he would accept the deal.

Topic: Preferences
Difficulty: 1
% Correct Responses: 0
Discrimination Index: 0

3.7 If good X is measured on the horizontal axis and good Y on the vertical, what can you say about the preferences of someone whose indifference curves are a) Parallel to the Y axis? b) Positively sloped with more desirable indiffernce curves as one moves to the right? c) Negatively sloped with more desirable indifference curves as one moves to the left?

Answer: a) This person doesn't care how much X he has. b) This person likes X but hates Y. c) This person hates both goods.

Topic: Preferences
Difficulty: 2
% Correct Responses: 0
Discrimination Index: 0

3.8 Suppose that there are two commodities and a consumer prefers more to less of each good. If the consumer has transitive preferences, can her indifference curves cross? Sketch a brief proof of your answer, and illustrate with a diagram.

Answer: See the textbook.
